PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Jozsef VARGA et al. Group Art Unit: Unassigned

Application No.: New Application Examiner: Unassigned

Filed: August 4, 2003 Attorney Dkt. No.: 60282-00078

For: REQUEST REDIRECTION HANDLING IN IMC

CLAIM FOR PRIORITY UNDER 35 USC § 119

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450 August 5, 2003

Sir:

The benefit of the filing dates of the following prior foreign application(s) filed in the following foreign country(ies) is hereby requested for the above-identified patent application and the priority provided in 35 U.S.C. §119 is hereby claimed:

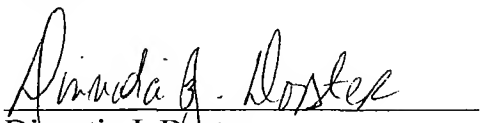
European Patent Application No. 03006573.4 filed on March 24, 2003 **in** EP

In support of this claim, certified copy of said original foreign application is filed herewith.

It is requested that the file of this application be marked to indicate that the requirements of 35 U.S.C. §119 have been fulfilled and that the Patent and Trademark Office kindly acknowledge receipt of these/this document(s).

Please charge any fee deficiency or credit any overpayment with respect to this paper to Counsel's Deposit Account No. 50-2222.

Respectfully submitted,



Dinnatia J. Doster
Registration No. 45,268

Customer No. 32294
SQUIRE, SANDERS & DEMPSEY LLP
14TH Floor
8000 Towers Crescent Drive
Tysons Corner, Virginia 22182-2700
Telephone: 703-720-7800
Fax: 703-720-7802

DJD:erh

Enclosure: Priority Document (1)

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Bescheinigung | Certificate | Attestation

Die angehefteten Unterlagen stimmen mit der ursprünglich eingereichten Fassung der auf dem nächsten Blatt bezeichneten europäischen Patentanmeldung überein.

The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

03006573.4

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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Applicant(s):
Demandeur(s):
Nokia Corporation
02150 Espoo
FINLAND

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Request redirection handling in IMC

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TITLE OF THE INVENTION

Request Redirection Handling in IMC

FIELD OF THE INVENTION

The present invention relates to service request handling in IMC (IP Multimedia Core). In particular, the invention relates to redirecting a service request for a served user in IMC.

BACKGROUND OF THE INVENTION

There are many applications of the Internet that require the creation and management of a session, where a session is considered an exchange of data between an association of participants. The implementation of these applications is complicated by the practices of participants: users may move between endpoints, they may be addressable by multiple names, and they may communicate in several different media - sometimes simultaneously. Numerous protocols have been authored that carry various forms of real-time multimedia session data such as voice, video, or text messages. The Session Initiation Protocol (SIP) works in concert with these protocols by enabling Internet endpoints (called user agents) to discover one another and to agree on a characterization of a session they would like to share. For locating prospective session participants, and for other functions, SIP enables the creation of an infrastructure of network hosts (called proxy servers) to which user agents can send registrations, invitations to sessions, and other requests. SIP is an agile, general-purpose tool for creating, modifying, and terminating sessions that works independently of underlying transport protocols and without dependency on the type of session that is being established.

More details about SIP as defined by the IETF are described in RFC 3261. As mentioned above, SIP allows the establishment,

handling and release of end-to-end multimedia sessions. There are several additions to the SIP protocol, which e.g. allow event notification based on SIP, which is the basis for a SIP based Presence Service and other services.

The 3GPP IMS (Third Generation Partnership Project IP Multimedia Subsystem) utilizes SIP in order to achieve a wide range of functionality within the 3GPP (wireless) network.

S-CSCFs (Serving Call State Control Functions) in the IMS download filter criterions (FCs) from a HSS (Home Subscriber System). FCs are evaluated one-by-one, i.e. an incoming request is checked by a terminating S-CSCF based on the public user identity in the Request-URI (Universal Resource Identifier) as to whether the first or initial FC (highest priority) matches. If it matches, the S-CSCF sends it to the related Application Server (AS) that is indicated by the FC and adds a "dialog identifier" in the route header that is pointing back to the S-CSCF.

When the request is sent back from the AS and received again at the S-CSCF, the S-CSCF identifies the request by the dialog identifier and checks for matching of the next following FCs of lower priority, and applies the filter criteria on the SIP method as received from the previously contacted AS. Depending on the result of the previous process, the S-CSCF may contact one or more application server(s).

Due to some special services it might be that the AS e.g. redirects the request (e.g. Call Forwarding). In these cases, it might be not desirable for the AS that the S-CSCF performs the subsequent FCs. According to the prior art, such behaviour of the S-CSCF cannot be affected by the AS.

Call forwarding as an example of service request redirection is one of the most generally used services in telecommunication systems. Its utilization significantly

impacts session handling in IP Multimedia Core Subsystem, thus it should be accurately defined.

The latest version of 3GPP TS 24.229 Release 5 standard (v.5.3.0) specifies terminating procedures at S-CSCF generally without considering the special effects of executed services. Request redirection modifies the Request-URI data of the affected session, which requires special processing in S-CSCF which cannot be accomplished with the general description of the standard. According to the prior art as described in chapter 5.4.3.3 "Request terminated at the served user" of 3GPP TS 24.229, v.5.3.0, in a situation of request redirection such as call forwarding, the execution of the rest of procedures will conflict with the purpose of call forwarding. According to the general description in point 11 of chapter 5.4.3.3 "Request terminated at the served user" of 3GPP TS 24.229, v.5.3.0, the Request-URI is overwritten, eliminating the possibility of call forwarding itself. In other words, according to the prior art, a Request-URI is built by the S-CSCF with the contents of a saved Contact URL (Universal Resource Locator) where the user served by the S-CSCF is reachable, which Contact URL is determined from the destination public user identity.

A specific description of call forwarding is not given so far in IP Multimedia Subsystem (IMS), and call forwarding handling in IMS is completely different from that in other existing systems.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to enable request redirection such as call forwarding in IMC.

According to the invention, this object is achieved by a method of processing a service request according to claim 1, a

method of processing a service according to claim 16 and a method of handling a service request according to claim 26.

Moreover, the above object is achieved by a device according to claim 12 and a device for processing a service request according to claim 27.

Furthermore, the above object is achieved by a unit according to claim 22 and a unit for processing a service according to claim 28.

In addition, the above object is achieved by a computer program product according to claim 13 and a computer program product according to claim 23.

The above object is further achieved by an IP multimedia core network according to claim 29.

Further features of the present invention are defined in the dependent claims.

According to the invention, the tasks to be executed by a terminating S-CSCF in case of call forwarding are defined. In case of call forwarding, the terminating S-CSCF does not evaluate further filters but handles the call forwarding. Moreover, tasks which may be executed by an application server in case of call forwarding are defined.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A shows a flow diagram illustrating a method of service request processing according to the present invention.

Fig. 1B shows a flow diagram illustrating a method of service processing according to the present invention.

Fig. 2 shows a schematic block diagram illustrating a serving device and a processing unit in an IP multimedia core network according to the present invention.

Fig. 3 shows a signaling diagram illustrating service request handling according to an embodiment of the present invention.

Fig. 4 shows a signaling diagram illustrating an example of call forwarding handling in S-CSCF according to the embodiment of the present invention.

Fig. 5 shows a signaling diagram illustrating another example of call forwarding handling in S-CSCF according to the embodiment of the present invention.

DESCRIPTION OF THE INVENTION

Figs. 1A and 1B and Fig. 2 show the idea of the present invention.

Fig. 1A illustrates a method of processing a service request in an IP multimedia core network. In a first step S11, a service request for a user is received by a device serving the user. For example, this service request has been initiated by a first user towards a second user. After having received the service request, in step S12 it is forwarded to a unit for processing the service. Then, in step S16, a processing result is received from the processing unit, and on the basis of the received processing result in step S17 it is determined whether service request processing for the second user is to be stopped.

Fig. 1B shows a method of processing the service according to the service request forwarded to the processing unit. In a first step S13 a service request initiated by the first user towards the second user is received from the device serving the second user. In step S14 the service is processed, and in

step S15, a processing result is returned to the device, on the basis of which it can be determined in the device (in step S17 in Fig. 1A) whether service request processing for the second user is to be stopped.

Fig. 2 shows an IP multimedia core network (IMC network) arranged to perform steps S11 to S17 shown in Figs. 1A and 1B. In particular, the IMC network comprises a device serving a user for processing a service request for the served user and a processing unit for processing a service corresponding to the service request.

The serving device comprises a first receiving block for receiving a service request for the served user, a forwarding block for forwarding the received service request to the processing unit for processing the service, a second receiving block for receiving a processing result from the processing unit, and a determining block for determining, on the basis of the received processing result, whether service request processing for the served user is to be stopped.

The processing unit comprises a receiving block for receiving the service request from the serving device, a processing block for processing the service, and a returning block for returning a processing result to the serving device, on the basis of which it can be determined in the device whether service request processing for the second user is to be stopped.

According to an embodiment of the invention, the processing unit may include in the processing result an indication for stopping service request processing for the served (second) user. Accordingly, the serving device is arranged to check whether the processing result received from the processing unit includes the indication for stopping service request processing for the second user, and in case the indication is present, to stop service request processing for the second

user. The serving device may also be arranged to check whether the indication is valid.

Moreover, before stopping service request processing for the second user, the serving device may perform charging processing.

According to another embodiment of the invention, the received service request initiated by the first user may include a destination identifier of the second user, and upon service processing, the processing unit may determine that the service request is to be forwarded to a third user, replace the destination identifier of the second user by a destination identifier of the third user, and return the processing result with the destination identifier of the third user to the serving device. The serving device may compare the destination identifiers of the service request forwarded to the processing unit and the processing result received from the processing unit, and in case it is detected that the compared identifiers are different from each other, service request processing for the second user is stopped. In addition the serving device may determine, on the basis of the received processing result, whether the service request is to be forwarded to a third user, and may forward the service request to the third user on the basis of the destination identifier included in the processing result.

The service request of the first user received by the serving device for the second user may include an originating identifier of the first user, and the processing unit may include an originating identifier of the second user in the processing result when it determines during processing the service that the service request is to be redirected from the second user to a third user. Then, in the forwarding procedure, the serving device may detect that the originating identifier included in the processing result is the originating identifier of the second user, and may forward the

service request on the basis of the originating identifier included in the processing result. However, in case the originating identifier included in the processing result is not the originating identifier of the second user, the serving device may include the originating identifier of the second user in the service request to be forwarded. Alternatively, in the forwarding procedure, the serving device may always use the originating identifier included in the processing result.

According to an embodiment of the invention, the originating identifier of the first user is replaced by the originating identifier of the second user. Alternatively, the originating identifier of the second user is added to the originating identifier of the first user.

In the following, an embodiment of the invention will be described with reference to Figs. 3 to 5.

Fig. 3 shows a signaling diagram in which a user A (first user) sends an initial service request towards a user B (second user). The service request is received by a device in the IMC serving user B (serving device), e.g. an S-CSCF (Serving Call State Control Function). The S-CSCF forwards the initial service request to a corresponding application server AS (processing unit) for the user B at which the service request is processed. After that, the AS returns a processing result to the S-CSCF. In so far, the process corresponds to 3GPP TS 24.229 version 5.3.0 release 5, chapter 5.4.3.3 "Requests terminated at the served user".

According to the present invention, in processing the terminating services of a served subscriber or user in S-CSCF, after each service execution it should be checked whether the service included a process because of which the S-CSCF should not perform the subsequent filter criteria. For example, in case of service redirection such as call forwarding further terminating services of the called party should not be

executed, i.e., the check for matching of the next following filter criteria of lower priority should be stopped.

As shown in Fig. 3, the S-CSCF of the user B detects from the processing result received from the AS that the terminating processing for the user B is to be stopped. Before stopping the terminating processing, the S-CSCF may perform charging related functions as described in points 5 to 7 of chapter 6.4.3.3 "Request terminated at the served user" of 3GPP TS 24.229 v.5.3.0 release 5.

Further to the detection that the terminating processing is to be stopped, according to the invention it may be detected by the S-CSCF that the service request has to be forwarded to another user C. After such detection, the S-CSCF may handle this request redirection by performing charging related tasks as mentioned above and switching to originating mode, and finally forward the initial service request towards the user C as shown in Fig. 3.

Fig. 4 shows an example of the embodiment of Fig. 3. According to Fig. 4, the initial request sent towards the B S-CSCF includes an R-URI (Request-Universal Resource Identifier) (destination identifier) of user B. The B S-CSCF forwards the request to the AS of user B. In processing the service, the B AS may detect a redirection of the service request to user C, for example. Since in this case the B S-CSCF should not perform subsequent filter criteria, the B AS may set an indication that the B S-CSCF should not evaluate further filter criteria.

The AS may set this indication as part of e.g. the Request-URI of the request that is sent back to the S-CSCF. This may be a tag in the Request-URI, e.g.:

sip:Georg.Mayer@miesbach.de;FC=off

wherein "sip:Georg.Mayer@miesbach.de" is the R-URI of user C.

This indication may also be set in another way (e.g. extra header, parameter of another header, etc.)

The S-CSCF should then check if the indication is allowed to be set by the AS from which it received the request back. If it is allowed to set it, the S-CSCF should then stop evaluating the subsequent FCs and handle the request redirection immediately (or at least immediately after having performed charging operations as mentioned above). In other words, when the B S-CSCF detects the tag "FC=off" in the processing result returned from the B AS, it stops the terminating processing for the user B and switches to the originating role e.g. for handling a call forwarding towards the Request-URI indicated in the returned processing result.

Fig. 5 shows a further example of the embodiment of Fig. 3. According to Fig. 5, the initial request sent towards the B S-CSCF includes an R-URI (Request-Universal Resource Identifier) (destination identifier) of user B and a P-A-ID (P-Asserted Identity) header (originating identifier) of user A. The B S-CSCF forwards the request to the AS of user B. The result of processing the service may be a redirection of the service request to user C. In order to detect request redirection, the Request-URI sent to the AS and the Request-URI received from the AS are always compared by the S-CSCF. As shown in Fig. 5, the R-URI has changed from B to C, so that the S-CSCF detects that the executed request included a request redirection, such as call forwarding.

In call forwarding case the P-Asserted ID header should be modified so that the user C is enabled to notice that the request or call from user A is coming through user B. For example, if user C has a call barring for user A and user A calls user B who has call forwarding to user C, then from user

B's point of view the forwarding will fail. According to the invention, the modification of the P-Asserted ID header may be done either by the AS implementing the call forwarding service or the terminating S-CSCF that detects call forwarding (in case the AS did not modify the header). According to Fig. 5, the B AS has already modified the P-A-ID from A to B. The modification is either the replacement of the P-Asserted ID header with the served user's IMPU (IP Multimedia Public User Identity) (it can be another IMPU of the served user as well) as shown in Fig. 5, or the insertion of the served user's IMPU (again, it can be another IMPU of the served user as well) to the beginning of the original P-Asserted ID header, i.e. 'P-A-ID=B,A'. As shown in Fig. 5, the call is then forwarded with P-A-ID = B.

After the detection of call forwarding in the B S-CSCF, the B S-CSCF may carry out the tasks related to charging as it is described in points 5, 6, and 7 of chapter 5.4.3.3 "Request terminated at the served user" of 3GPP TS 24.229 v.5.3.0 release 5. If user B has set call forwarding, then user B should pay for the forwarded part of the call from B to C.

Upon completing charging related functionality the terminating S-CSCF changes the role from terminating S-CSCF to originating S-CSCF, and starts to operate as it is described in chapter 5.4.3.2 "Request initiated by the served user" of 3GPP TS 24.229 v.5.3.0 release 5, wherein the served user in this originating S-CSCF is the forwarding IMPU stored in P-Asserted ID header, i.e. user B. In other words, the B S-CSCF switches to originating role and forwards the initial service request towards user C in accordance with 3GPP TS 24.229 version 5.3.0 release 5, chapter 5.4.3.2 "Request initiated by the served user".

The B S-CSCF should ensure that all the restrictions/settings defined for the calls originated by B are fulfilled. Therefore, according to the present invention, the originating

services of the user B are executed. Not executing originating services in case of call forwarding, for example, would enable subscribers to call barred numbers by setting call forwarding to such numbers and calling themselves.

It is to be noted that the charging tasks shown as block 5 in Fig. 5 may also be performed in the embodiment shown in Fig. 4 after the detection that terminating processing for B is to be stopped and before actually stopping terminating processing for B. Moreover, the P-A-ID modification can also be applied to the embodiment shown in Fig. 4.

Moreover, it is to be noted that the above examples can be combined in different manners. For example:

With respect to R-URI change:
a. B AS just changes the R-URI, and there is no special indication in the processing result.
b. B AS indicates the change of R-URI in the processing result.

For changing P-A-ID there are two places for options:

The place of change:
0. No change (this is a possible option too, although this way C will not know that B is involved).
1. Done in B AS.
2. Done (at some point) in B S-CSCF after the redirection has been detected.

The way of change:
X. Replace A with B.
Y. Replace A with B,A.

Then, possible combinations are 0, 1X, 1Y, 2X, and 2Y.

Taking into account also the R-URI change, possible

combinations are a0, b0, a1X, b1X, a1Y, b1Y, a2X, b2X, a2Y, and b2Y.

It is to be understood that the above description is illustrative of the invention and is not to be construed as limiting the invention. Various modifications and applications may occur to those skilled in the art without departing from the true spirit and scope of the invention as defined by the appended claims.

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CLAIMS:

1. A method of processing a service request in an IP multimedia core network, comprising the steps of:

receiving a service request initiated by a first user, for a second user;

forwarding the received service request to a unit for processing the service;

receiving a processing result from the processing unit; and

determining, on the basis of the received processing result, whether service request processing for the second user is to be stopped.

2. The method according to claim 1, the determining step comprising the step of:

checking whether the processing result received from the processing unit includes an indication for stopping service request processing for the second user,

wherein in case the indication is present, service request processing for the second user is stopped.

3. The method according to claim 2, further comprising the step of:

in case the indication is present, checking whether the indication is valid.

4. The method according to any one of claims 1 to 3, further comprising the step of:

before stopping service request processing for the second user, performing charging processing.

5. The method according to any one of claims 1 to 4, wherein the service request forwarded to the processing unit and the processing result received from the processing unit each include a destination identifier, the determining step comprising the step of:

comparing the destination identifiers of the service request forwarded to the processing unit and the processing result received from the processing unit,

wherein in case it is detected that the compared identifiers are different from each other, service request processing for the second user is stopped.

6. The method according to any one of claims 1 to 5, further comprising the step of:

determining, on the basis of the received processing result, whether the service request is to be forwarded to a third user.

7. The method according to claim 6, wherein the service request forwarded to the processing unit and the processing result received from the processing unit each include a destination identifier, the determining step comprising the step of:

comparing the destination identifiers of the service request forwarded to the processing unit and the processing result received from the processing unit,

wherein in case it is detected that the compared identifiers are different from each other,

switching to originating mode and forwarding the service request on the basis of the destination identifier included in the processing result.

8. The method according to claim 6 or 7, wherein the service request forwarded to the processing unit and the received processing result each include an originating identifier, the method comprising the step of:

detecting whether the originating identifier included in the processing result is the originating identifier of the second user; and

in case the originating identifier included in the processing result is the originating identifier of the second

user, forwarding the service request on the basis of the originating identifier included in the processing result.

9. The method according to claim 8, wherein in case the originating identifier included in the processing result is not the originating identifier of the second user, the originating identifier of the second user is included in the service request to be forwarded on the basis of the processing result.

10. The method according to claim 8 or 9, wherein the originating identifier of the first user is replaced by the originating identifier of the second user.

11. The method according to claim 8 or 9, wherein the originating identifier of the second user is added to the originating identifier of the first user.

12. A device for processing a service request in an IP multimedia core network, the device being arranged to execute the steps of the method according to any one of claims 1 to 11.

13. A computer program product, comprising software code portions for performing the steps of any one of claims 1 to 11 when the product is run on a computer.

14. The computer program product according to claim 13, wherein said computer program product comprises a computer-readable medium on which said software code portions are stored.

15. The computer program product according to claim 13, wherein said computer program product is directly loadable into the internal memory of the computer.

16. A method of processing a service in an IP multimedia core network, comprising the steps of:

receiving a service request initiated by a first user, for a second user, from a device serving the second user;

processing the service; and

returning a processing result to the device, on the basis of which it can be determined in the device whether service request processing for the second user is to be stopped.

17. The method according to claim 16, further comprising the step of:

including in the processing result an indication for stopping service request processing for the second user.

18. The method according to claim 16 or 17, wherein the received service request includes a destination identifier of the second user, the method comprising the further steps of:

upon service processing, determining that the service request is to be forwarded to a third user;

replacing the destination identifier of the second user by a destination identifier of the third user; and

returning the processing result with the destination identifier of the third user.

19. The method according to claim 18, wherein the received service request includes an originating identifier of the first user, the method comprising the further steps of:

including an originating identifier of the second user in the processing result when determining that the service request is to be redirected to a third user.

20. The method according to claim 19, wherein the originating identifier of the first user is replaced by the originating identifier of the second user.

21. The method according to claim 19, wherein the originating identifier of the second user is added to the originating identifier of the first user.

22. A unit for processing a service in an IP multimedia core network, the device being arranged to execute the steps of the method according to any one of claims 16 to 21.

23. A computer program product, comprising software code portions for performing the steps of any one of claims 16 to 21 when the product is run on a computer.

24. The computer program product according to claim 23, wherein said computer program product comprises a computer-readable medium on which said software code portions are stored.

25. The computer program product according to claim 23, wherein said computer program product is directly loadable into the internal memory of the computer.

26. A method of handling a service request in an IP multimedia core network, comprising the steps of:

receiving a service request initiated by a first user, for a second user, in a device serving the second user;

forwarding the received service request to a unit for processing the service;

receiving the forwarded service request in the processing unit;

processing the service in the processing unit;

returning a processing result to the device, on the basis of which it can be determined in the device whether service request processing for the second user is to be stopped;

receiving the processing result by the device from the processing unit; and

determining, on the basis of the received processing result, whether service request processing for the second user is to be stopped.

27. A device for processing a service request in an IP multimedia core network, comprising:

means for receiving a service request initiated by a first user, for a second user;

means for forwarding the received service request to a unit for processing the service;

means for receiving a processing result from the processing unit; and

means for determining, on the basis of the received processing result, whether service request processing for the second user is to be stopped.

28. A unit for processing a service in an IP multimedia core network, comprising:

means for receiving a service request initiated by a first user, for a second user, from a device serving the second user;

means for processing the service; and

means for returning a processing result to the device, on the basis of which it can be determined in the device whether service request processing for the second user is to be stopped.

29. An IP multimedia core network comprising a device according to claim 25 and a unit according to claim 26.

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ABSTRACT:

According to an aspect of the invention a method of processing a service request in an IP multimedia core network is disclosed. The method comprises the steps of receiving a service request initiated by a first user, for a second user, forwarding the received service request to a unit for processing the service, receiving a processing result from the processing unit, and determining, on the basis of the received processing result, whether service request processing for the second user is to be stopped.

(Fig. 1A)

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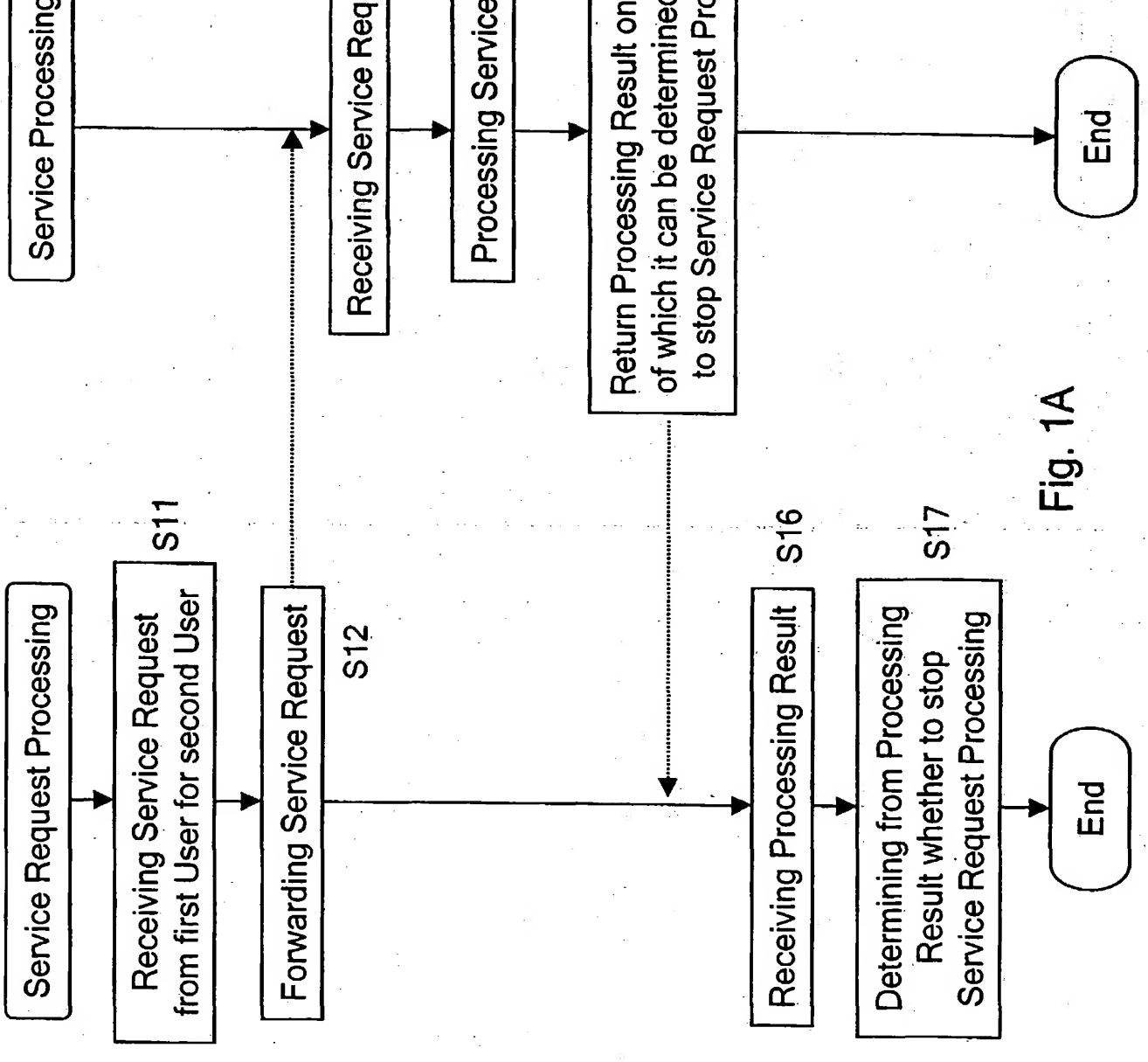

Fig. 1A

Fig. 1B

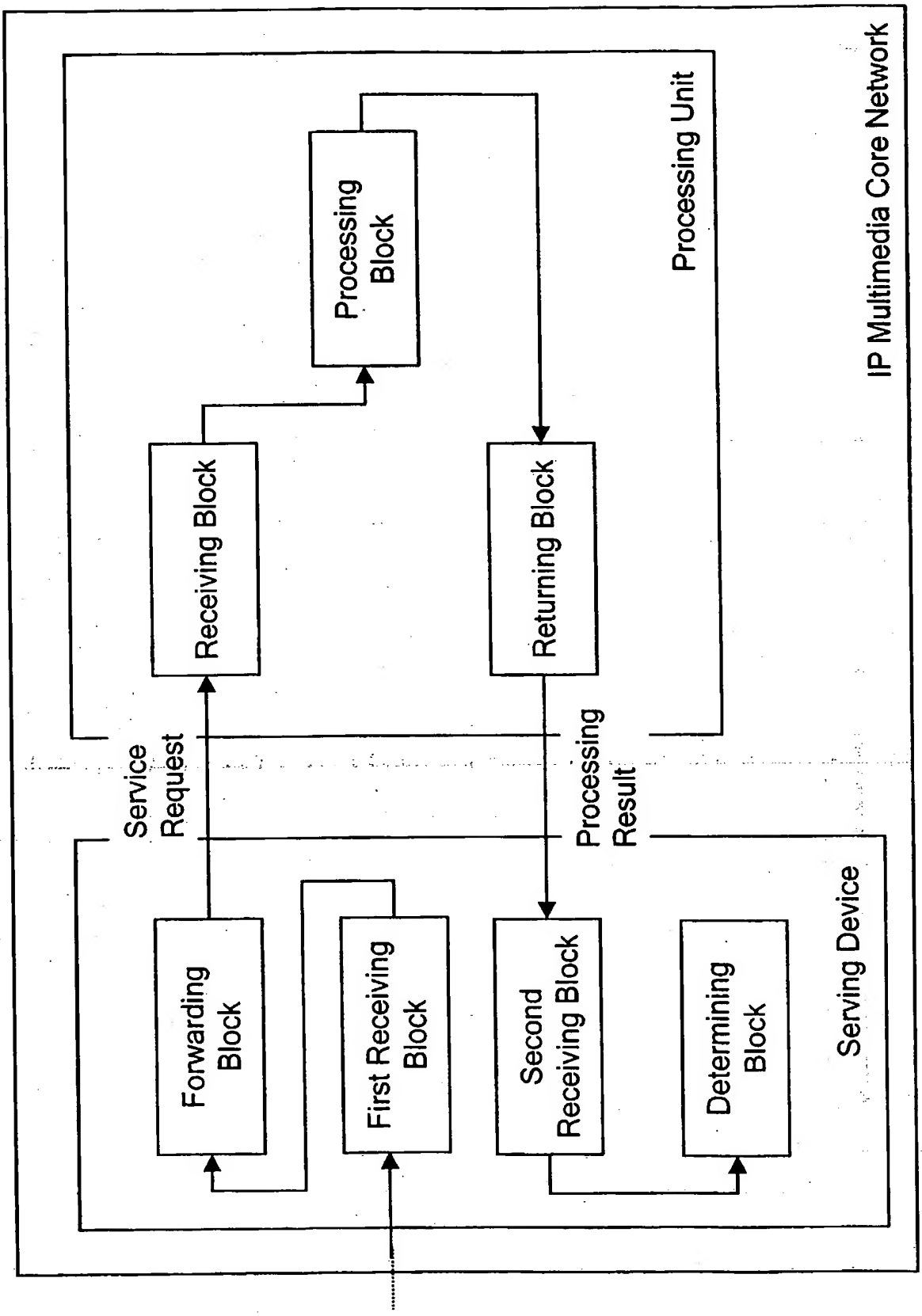
IP Multimedia Core Network
Processing Unit
Processing Block
Receiving Block
Returning Block
Service Request
Processing Result
Serving Device
Forwarding Block
First Receiving Block
Second Receiving Block
Determining Block

Fig. 2

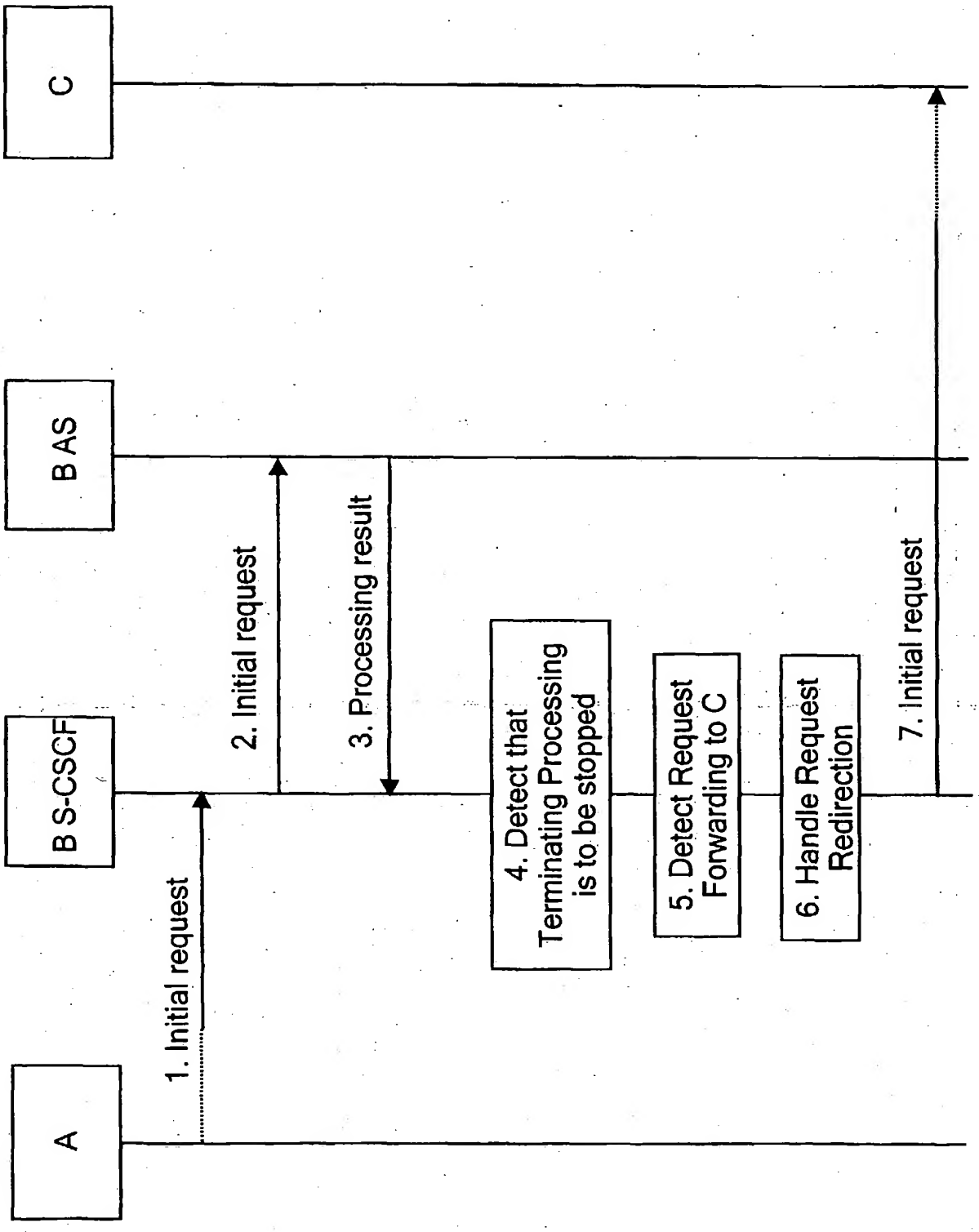
A
B S-CSCF
B AS
C
1. Initial request
2. Initial request
3. Processing result
4. Detect that Terminating Processing is to be stopped
5. Detect Request Forwarding to C
6. Handle Request Redirection
7. Initial request

Fig. 3

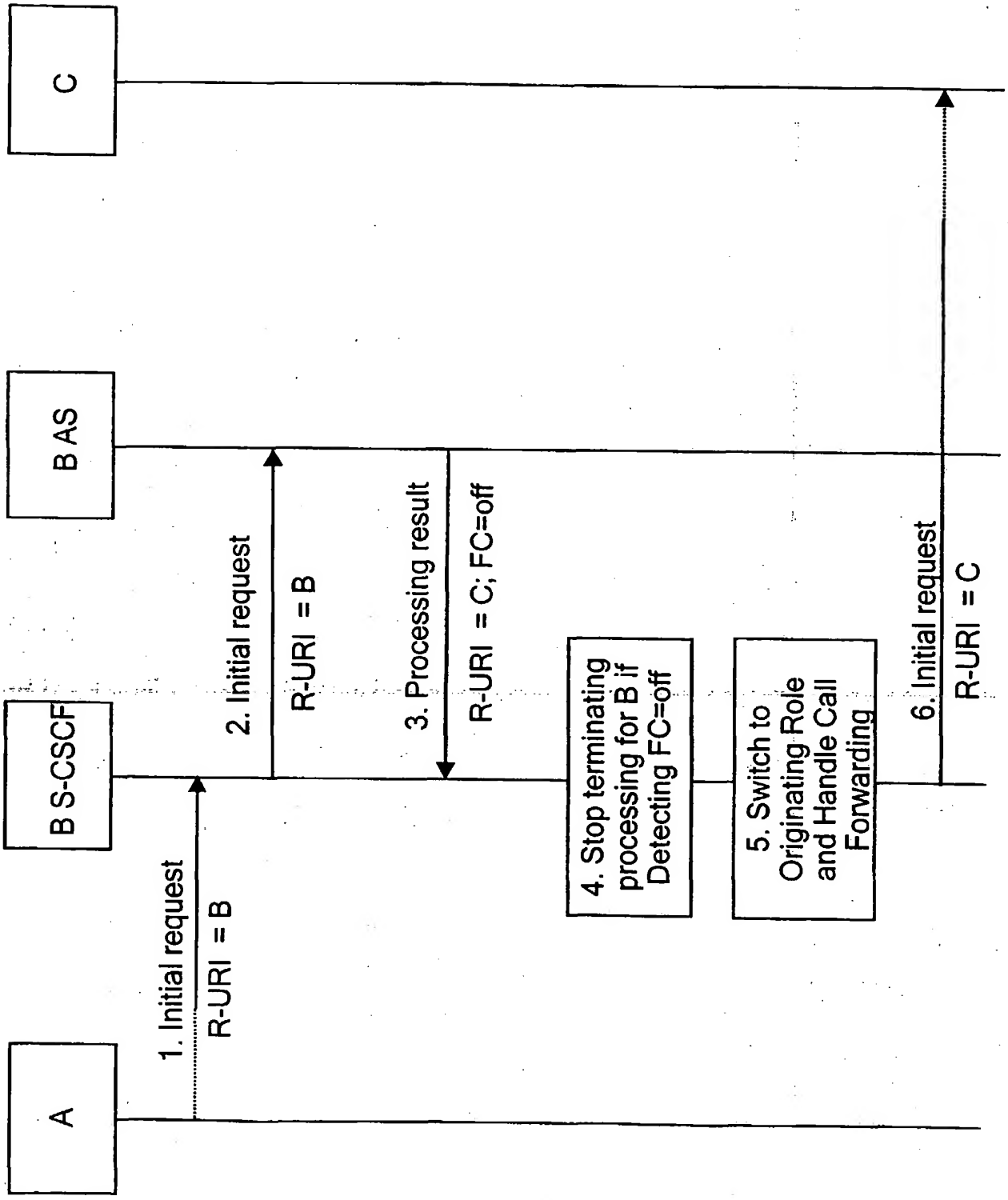
A
B S-CSCF
B AS
C
1. Initial request
R-URI = B
2. Initial request
R-URI = B
3. Processing result
R-URI = C; FC=off
4. Stop terminating processing for B if Detecting FC=off
5. Switch to Originating Role and Handle Call Forwarding
6. Initial request
R-URI = C

Fig. 4

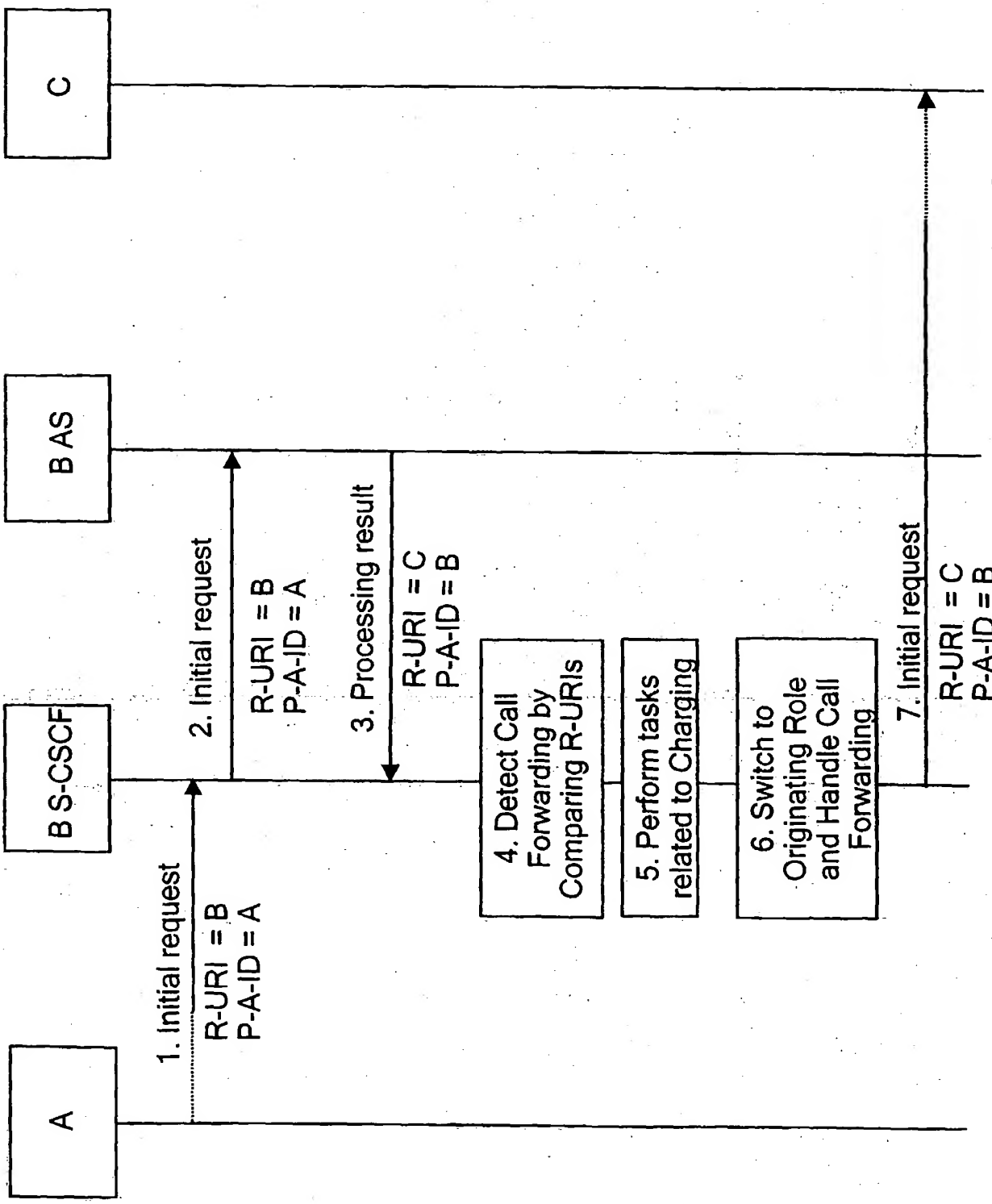
A
B S-CSCF
B AS
C
1. Initial request
R-URI = B
P-A-ID = A
2. Initial request
R-URI = B
P-A-ID = A
3. Processing result
R-URI = C
P-A-ID = B
4. Detect Call Forwarding by Comparing R-URIs
5. Perform tasks related to Charging
6. Switch to Originating Role and Handle Call Forwarding
7. Initial request
R-URI = C
P-A-ID = B

Fig. 5